

Work Order ID 73924

Monday, September 19, 2011 12:36:33 PM

Page 1

Item ID: D350-748-201

Accept

Revision ID:

Item Name: Crosstube Installation, High Aft

Start Date: 9/19/2011 Start Qty: 1.00

Required Date: 10/14/2011 Req'd Qty: 1.00

Reference:

Approvals:

Process Plan:

Date: 11-09-19

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run

Start

Stop

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

Draw Nbr

Revision Nbr

D350-748-241

F

100

0.00



DOCUMENT CONTROL

DC

Memo

Document Control

Photocopy bluefile & type labels per PPD350-748-201 CHG002

110

0.00



BENDING MACHINE - CROSSTUBES

CNC Bend 2

Memo

0.00

CNC Alpha 160 Bender

Bend tube as per Dwg D350-748-241 using CNC bender program D350A and Folio FT

120

0.00



QC15- Crosstube Dimensional Check

QC

Memo

0.00

Quality Control

NOTE: Date & Initial
H:\FORMS\Quality Assurance\approved QA\NCRW0 Rev0

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

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Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
125		0.00							
	HandFXtube	0.00				1		SAD	12-01-20
Hand Finishing Crosstubes	<p>Memo</p> <p>***Stress relief***</p> <p>Heat treat crosstube as per QSI010 4.3</p> <p>Temp: <u>375</u></p> <p>Start time: <u>4h30</u></p> <p>Finish time: <u>9h30</u></p>								
127	QC5- Inspect part completeness to step on W/O	0.00							
	QC	0.00							Sr12/1/12
Quality Control	Memo								

ISSUE PO H3H LPT per QSI 0380
14454 ASTM 1417 Level 2

~~12-03-2~~
12-03-15

W/O:		WORK ORDER CHANGES					
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Run Start

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

130

0.00



Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Drill Tube as per Dwg D350-748-241 Using DT8876 Drill Jigs,
Set-up drill table as per QSI 010

2-Deburr

3-Engrave Part # and Batch # as per Dwg D350-748-241

4-Remove all marks from tube within limits of D350-748-241

5- Apply a light coat of LPS3 on the interior of tube
Batch: M110779

140

0.00



QC

QC6- Inspect dimensions to drawing

Memo

0.00

Quality Control

MO
TW

12/1/24

TW R-1-24

12/1/25

w 12 01 25 ①

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Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150

Outsource process-Cadplate per QSI017 4.1.9.1

0.00



Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O: 15990

Stress relief at 375° for 5 hours

Magnetic Particle Inspect per ASTM E1444

Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2

Embrittle relief at 375° for 8 hours, Chromate Treat

Possibe Supplier: Southwest United Industries

Ensure Certificate of Conformity is attached

CL 12/01/25 ①

160

Receive & Inspect for Damage & Mat'l Certs

0.00



Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

12/23/01 ①
12/3/05 ④
12/3/10 ①

170

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

P10 →

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D300-748-201 PAR #: _____ Fault Category: Carbonyl Cracks / Cracks NCR: Yes No DQA: _____ Date: _____
Design form
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
		late <u>to</u> cracks found During NDT inspection R.C. Process.	<u>WAB</u> <u>12/05/23</u> <u>PS1042</u>	- Buff out markings - Re NDT Re Buff out mark	<u>FAIRLY</u>		<u>WAB</u> <u>12/05/23</u> <u>PS1042</u>	<u>S</u> <u>12/13/16</u>
				Re NDT ultra sonic area to find out wall thickness	<u>FAIRLY</u> <u>12/05/23</u>	<u>S</u> <u>12/13/23</u>	<u>S</u> <u>12/13/16</u>	
				Weld Eng. Approval <u>SEAD</u>			<u>S</u> <u>12/13/16</u>	

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Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180		0.00							
	SprayPaint								
SprayPaint	Memo	0.00							
Spray Painting	1-Prime inside crosstube as per QSI 005 4.2 2-Paint Outside of Tube as per Dart QSI 005 4.2								
190		0.00							
	QC14- Inspect Spray Paint								
QC	Memo	0.00							
Quality Control	Then, Wrap in plastic bag to protect from scratches								
200		0.00							
	Crosstubes								
Crosstubes	Memo	0.00							
Crosstubes	1-Install Ground wire Insert, then insert screw and washer 2-Install Abrasion strips as per Dwg D350-748-241 & QSI 035. 3-Install supports Using Dt8876 as per Dwg D350-748-241, Torque to 60-80 IN-LBS								

W/O:		WORK ORDER CHANGES					
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[illegible][illegible]

Stop

1. **Author(s)**
 2. **Title**
 3. **Journal**
 4. **Volume**
 5. **Issue**
 6. **Page(s)**
 7. **Year**
 8. **DOI**
 9. **URL**
 10. **Accession Number**
 11. **Keywords**
 12. **Abstract**
 13. **Notes**
 14. **References**
 15. **Comments**
 16. **History**
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Cust Item ID:[illegible]

Customer:

Run Start

[illegible]

Stop

Abstract

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

**Insp.
Stamp**

0.00

QC

Memo

0.00

Quality Control

220

Pick Kit

0.00

[illegible]

Packaging

Memo

0.00

Packaging

230

QC4- 100% Inspect kits for completeness

0.00

QC

Memo

0.00

Quality Control

W/O:		WORK ORDER CHANGES					
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Run Start



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPPD350-748-201								
	Location: _____								
	PPP Rev: _____								
250		0.00							
	QC21- Final Inspection - Work Order Release								
QC	Memo	0.00							
Quality Control									

mf
12-05-23

W/O:		WORK ORDER CHANGES					
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Picklist Print

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Parent Item: D350-748-201



Parent Item Name: Crosstube Installation, High Aft

Start Date: 9/19/2011

Required Date: 10/14/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev: A New Issue 06-07-05 JLM
 IPP Rev: B Update qty of MS21042L5 06-09-12 KJ
 IPP Rev C Combined manufacturing 08.04.02 EC verified by: DD
 IPP Rev:D 08-06-24 revD as per dwg DD verified by:EC
 IPP Rev: E 08.12.11 Step17 was step 21 KJ Verified by:EC IPP Rev:F
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-241TRN		Manufactured	No			110	Each	9.0000	1	1			
Crosstube Turning Detail													

Location Loc Qty Loc Code

LG	8	
61314	0	
61315	0	
68838	1	
68839	1	
68841	1	
70654	1	
72330	1	
72331	1	
72332	1	
72333	1	
LG003	1	
68840	1	

ALS4-1032-225

Purchased

No

200

Each

1,883.000

1

1



Insert

Location Loc Qty Loc Code

ST282	1883	
110768	62	
117717	9	
118386	860	
118696	952	

JW 12-1-19

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Start Qty: 1.00

Required Qty: 1.00

AN960JD10 NAS1149D0363J Purchased No

200 Each

0.0000 1 1



Washer

D2856-400 Manufactured No

200 f

208.9845 1.181 1.243158



Abraison Strip

Location

Loc Qty

Loc Code

ST403

0.3149

68076

0.3149

ST409

208.6696

63735

0.6696

71164

208

1- cut as per dwg D2856

D3502-1 Manufactured No

200 Each

43.0000 2 2



Support

Location

Loc Qty

Loc Code

ST063

43

61206

7

64004

10

68951

12

72129

14

MS21920-20 Purchased No

200 Each

74.0000 2 2



Clamp (per MIL-DTL-8783C)

Location

Loc Qty

Loc Code

LG050

74

116799

10

118236

18

118649

46

W/O:		WORK ORDER CHANGES					
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Start Date: 9/19/2011

Required Date: 10/14/2011

Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

295.0000

1

1



Screw

Location

Loc Qty

Loc Code

ST290

95

117441

95

ST291

200

118612

200

AN4-41A

Purchased

No

220

Each

309.0000

8

8



Bolt

Location

Loc Qty

Loc Code

ST360

309

115108

34

115705

50

116191

50

117619

50

117795

25

118451

50

118838

50

AN4-6A

Purchased

No

220

Each

1,216.000

16

16



Bolt

Location

Loc Qty

Loc Code

ST356

1200

117872

200

118422

300

118628

400

118838

300

ST358

16

117514

16

W/O:		WORK ORDER CHANGES					
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Picklist Print

Monday, September 19, 2011 12:36:43 PM

Work Order ID: 73924

Parent Item: D350-748-201

Parent Item Name: Crosstube Installation, High Aft

Start Date: 9/19/2011

Required Date: 10/14/2011

Start Qty: 1.00

Required Qty: 1.00

AN5-32A Purchased No 220 Each 172.0000 4 4



Bolt



Location

Loc Qty

Loc Code

ST339

50

118628

50

ST340

122

117161

1

117872

60

118191

11

118422

50

AN960JD416 NAS1149D0463J Purchased No 220 Each 0.0000 32 32



Washer

AN960JD516 NAS1149D0563J Purchased No 220 Each 0.0000 8 8



Washer

D3500-1 Manufactured No 220 Each 16.0000 4 4



Saddle

Location

Loc Qty

Loc Code

ST424

9

66127

9

ST424/25

7

62207

7

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

Monday, September 19, 2011 12:36:44 PM

Work Order ID: 73924

Parent Item: D350-748-201

Parent Item Name: Crosstube Installation, High Aft

Start Date: 9/19/2011

Required Date: 10/14/2011

Start Qty: 1.00

Required Qty: 1.00

D3501-1 Manufactured No 220 Each 245.0000 16 16



Bushing

Location Loc Qty Loc Code

ST063 202

68939 102

70682 100

ST066 43

67757 43

MS21042L4 Purchased No 220 Each 4,317.000 24 24



Nut

Location Loc Qty Loc Code

ST300 4317

117441 51

117601 637

117885 629

118451 2000

118927 1000

MS21042L5 Purchased No 220 Each 1,287.000 4 4



Nut

Location Loc Qty Loc Code

ST300 1287

116105 5

116548 53

117441 343

117611 90

118179 496

118910 300

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

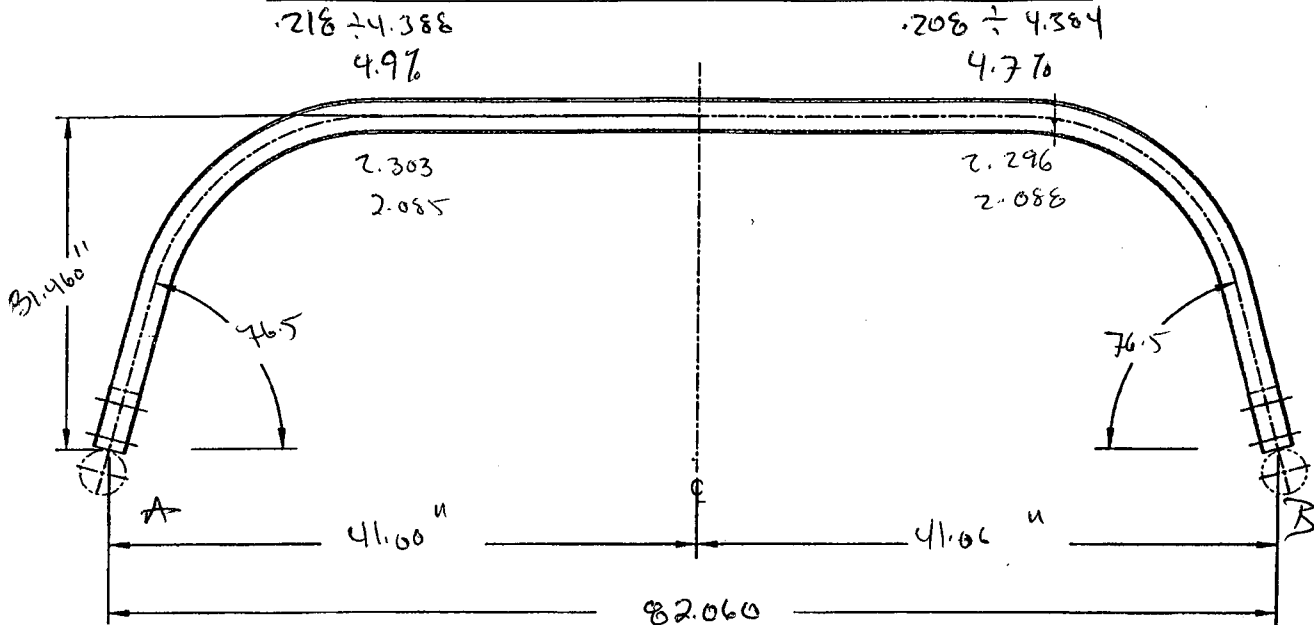
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	13924
Description: Crosstube High Aft (AS350/355)		Part Number:	D350-748-201
Inspection Dwg: D350-748-241 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	31.22	31.48
1/2 Span	40.77	41.03
Angle	75	77
Total Span	81.54	82.06



Comments
twist = 0.310
Side A = 4.9% crush @ 12 Passes
Side B = 4.7% crush @ 12 Passes
Acceptable UP 12.0.23 B.1012

QC15 Inspection	5
Date	12/01/23

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE; Date & initial all entries

Item	Qty -241	Part Number	Description
1	X	D350-748-241	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6015-125	CROSSTUBE (OR D6018-125)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 73924

pl 11-08-19

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6018-125
FINISHED LENGTH = 122.700±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-241" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) RUN CUTTER OFF PART WHERE INDICATED. BLEND OUT ALL EDGES FROM MACHINING
LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER
BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

RELEASED
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); ADD TOLERANCES (ZN C6-3, D2-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6018-125 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	<i>JP</i>	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	<i>JP</i>		
CHECKED	<i>JP</i>	DRAWING NO.	REV. F
MFG. APPR.	<i>JP</i>	D350-748-241	SHEET 1 OF 4
APPROVED	<i>JP</i>	TITLE	SCALE
DE APPR.	<i>JP</i>	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

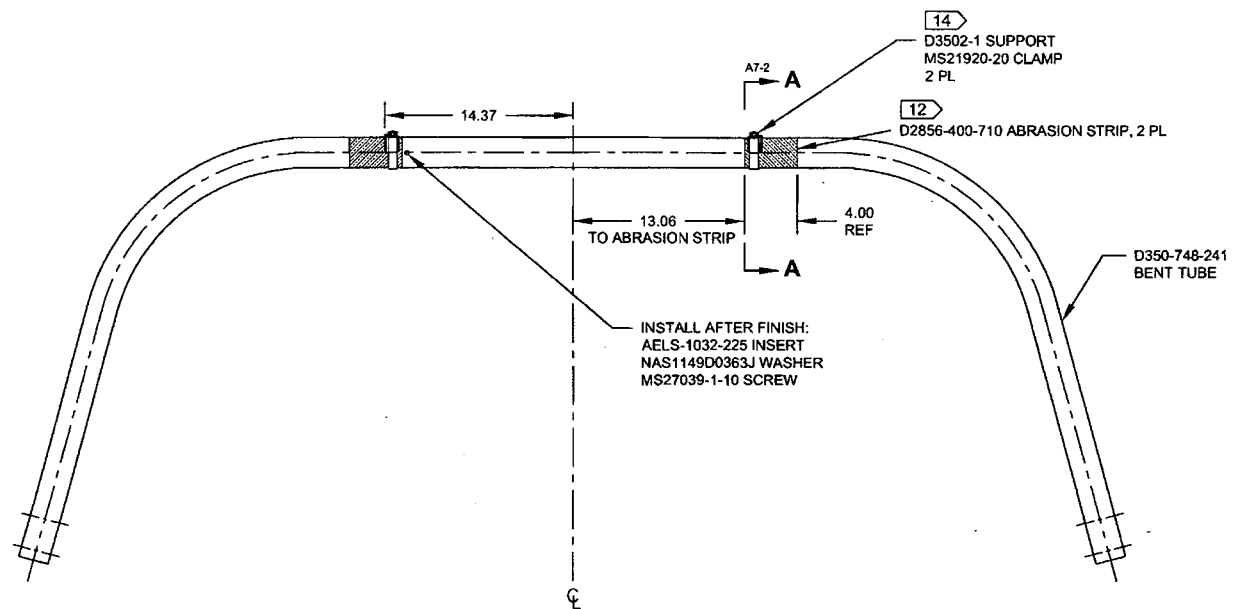
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

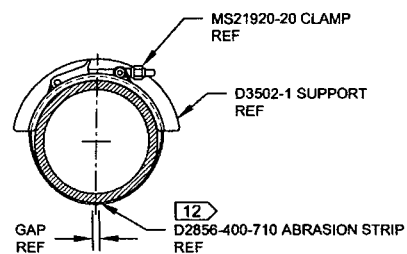
NOTE: Date & initial all entries



**D350-748-241
ASSEMBLY DETAIL**

13924

RELEASED
2011-03-19



SECTION A-A D4-2
SCALE 4X

DESIGN	90	DART AEROSPACE LTD	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	13	DRAWING NO.	REV. F
MFG. APPR.	13	D350-748-241	SHEET 2 OF 4
APPROVED	13	TITLE	SCALE
DE APPR.	13	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRELIMINARY AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

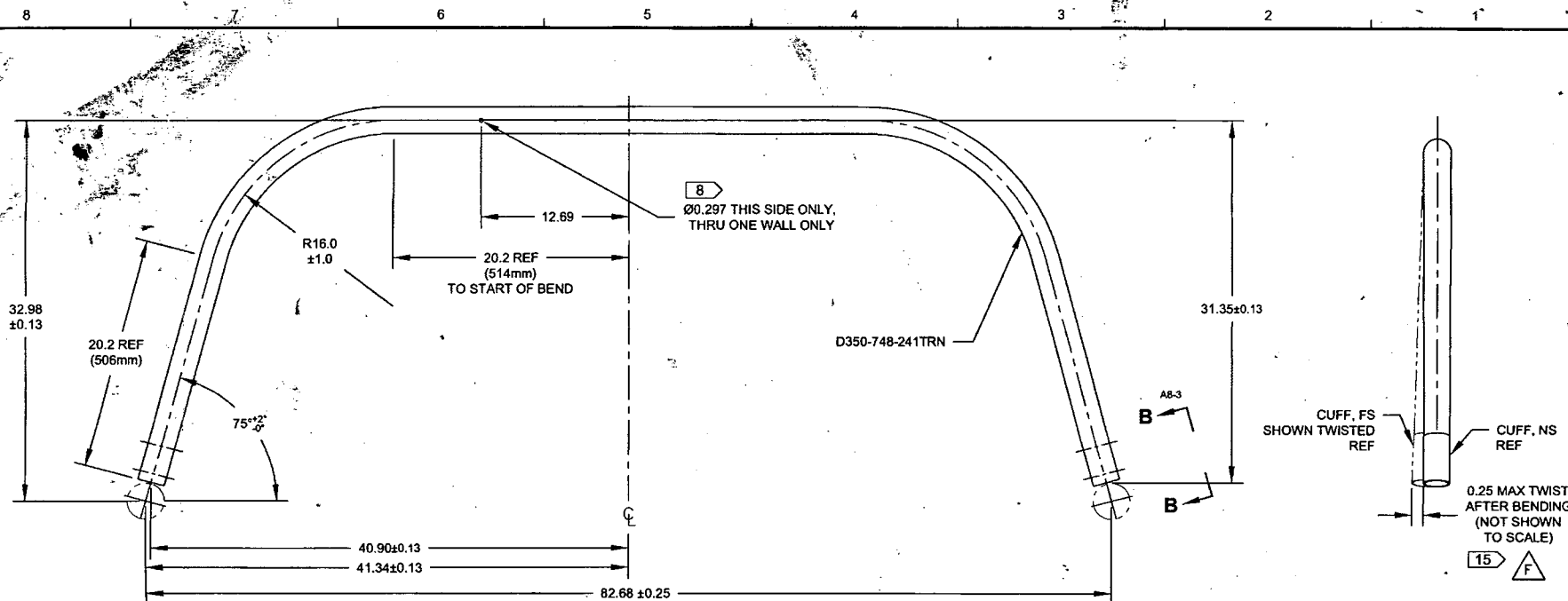
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



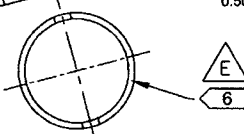
D350-748-241
BENDING AND DRILLING DETAIL 10

RELEASED
 2011-01-18

73924

Ø0.323 ±0.005 THRU, TYP
 HOLE TO BE ALIGNED
 WITHIN ±0.001 OF HOLE
 ON OTHER SIDE OF CUFF,
 TO BE DRILLED AFTER BENDING

C2-3 **VIEW B-B**
 SCALE 4X



DESIGN	90	DART AEROSPACE LTD	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	5	DRAWING NO.	REV. F
MFG. APPR.	2	D350-748-241	SHEET 3 OF 4
APPROVED	1	TITLE	SCALE
DE APPR.	1	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD	
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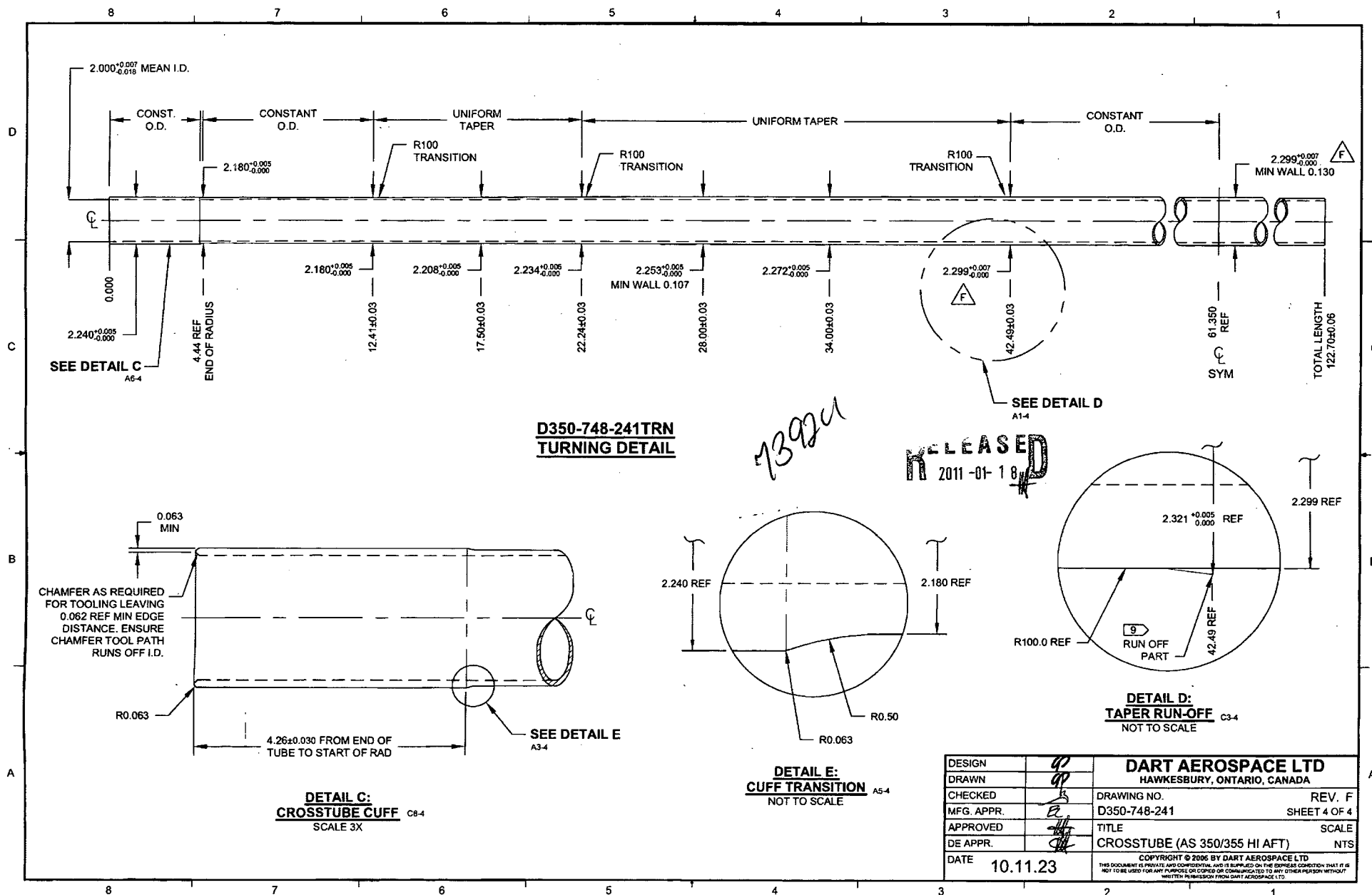
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

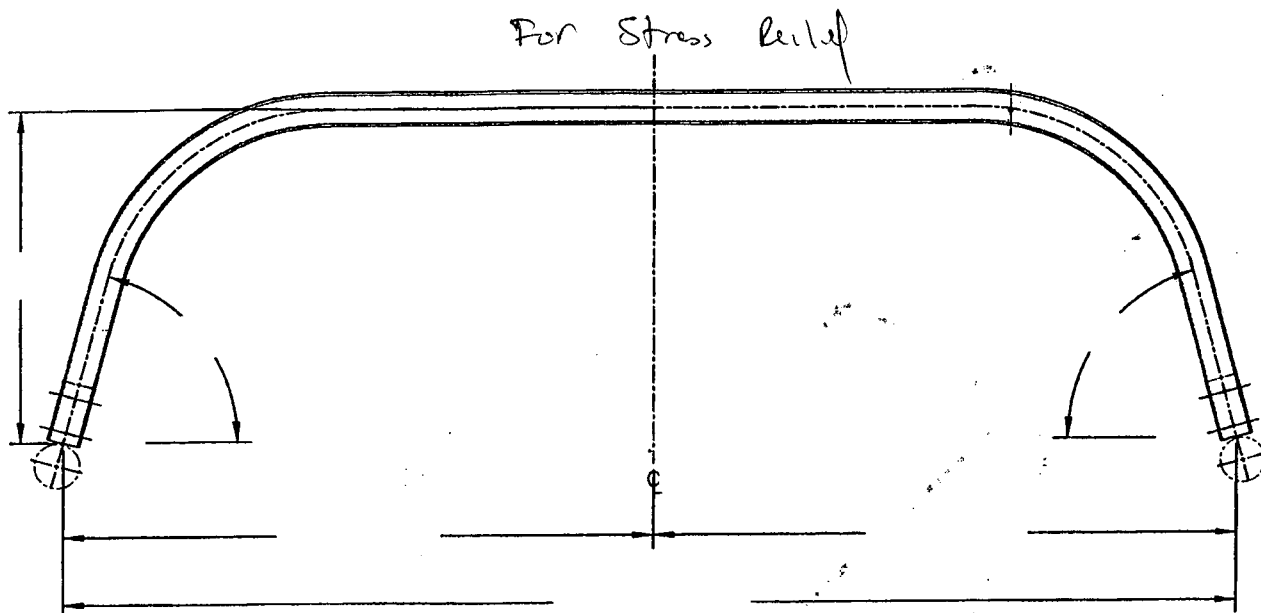
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NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order: 73924	
Description: Crosstube High Aft (AS350/355)		Part Number: D350-748-201	
Inspection Dwg: D350-748-241 Rev: E			Page 1 of 1

Required Dimension	Min	Max
Height	31.22	31.48
1/2 Span	40.77	41.03
Angle	75	77
Total Span	81.54	82.06



Comments
twist = 0.310

QC15 Inspection	
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

**CERTIFICATE OF
CONFORMANCE**

**CADORATH PLATING CO. LTD.
2150 LOGAN AVENUE
WINNIPEG, MANITOBA R2J-0J1**

DATE: Feb-24-2012

CONSIGNEE TO: Dart Aerospace Ltd.
1270 Aberdeen St.
Hawksbury, ON K6A 1K7

W/O #: 111684
INVOICE #: 59166

**CONTRACT OR
PURCHASE ORDER # PO15990**

DESCRIPTION: SKID

QTY 1

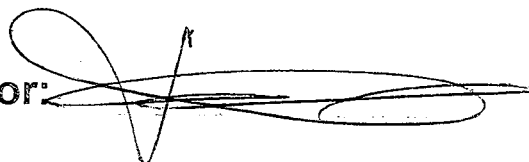
P/N # d350-748-101

S/N # 73924

STRESS RELIEVE BAKE HEAT CHART # 12-132. MPI IAW ASTM-E-1444. CADMIUM PLATE IAW AMS-QQ-P-416C TYPE 2 CLASS 2.
BAKE HEAT CHART # 12-170. MPI IAW ASTM-E-1444.

CERTIFICATE: I certify that the items indicated here on have been inspected and tested and conform to all specifications and requirements detailed on the contract or purchase order.

Approved Inspector:



W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
11/1/01	161	Load TUBE TO 3000 LB FOR 1 MINUTE REF DIS EMAIL	GP	12.03.01		GP 12-03-01 DS/642		
11/1/01	162	NDT TUBE						

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Chris Provencal

From: David Shepherd <dshepherd@dartaero.com>
Sent: Tuesday, April 27, 2010 3:40 PM
To: 'Mike Petsche'
Cc: 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com
Subject: 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.



LIQUID PENETRANT TEST REPORT

P- 14903

AGENT: DART AGRO SLICE DATE: 03/02/2012 PAGE: 1 OF 1
ATTENTION: LINDA L. ACUREN JOB NO.: 180-12-C0058
ADDRESS: 1270 ABERDEEN POWO No.: -
HAWKES BURY ON. WORK LOCATION: SAME
ACCEPTANCE STD: ASTM 1417/04-03B REV./DATE: 2005
PROJECT: F.P.I. ON CROSS TUBES
ITEM(S) EXAMINED: (9)

TEST DESCRIPTION: SEE RESULTS PROCEDURE No. LT002 REV./DATE 2008 TECHNIQUE No. LT/ENH2 REV./DATE 2008
PART No.: - MATERIAL: STEEL / ALUMINUM THICKNESS: VARIOUS
SCOPE: A WET FLUORESCENT LIQUID PENETRANT EXAMINATION
ON 100% OF EXTERNAL SURFACE

TEST DETAILS
METHOD: ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED
MILLY BRAND: MAGNAFLUX BLACK LIGHT S/N: 16459 ☐ OUTPUT > 1000 μ W/cm² ☐ AMBIENT < 2 fc
PENETRANT: Z607 MINIMUM DWELL TIME: 45 MIN. LIGHTING EQUIP.: ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE
PENETRANT REMOVER: H2O MINIMUM DRY TIME: >10 MIN. OTHER: LABINO
DEVELOPER: SKD 52 MINIMUM DWELL TIME: 10 MIN. LIGHT METER S/N: 1098806 CAL DUE DATE: 03/27
DEVELOPER TYPE: ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE
SURFACE CONDITION: ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL
SURFACE TEMPERATURE: ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/ 50°F ☒ 10°C/ 50°F TO 52°C/ 125°F ☐ > 52°C/ 125°F

RESULTS- (☐ METRIC ☐ IMPERIAL)

CROSS TUBES				
1	- W.O.	73924		X
1	- W.O.	76252	✓	REBLAND 1 TIME.
1	- W.O.	75662	✓	REBLAND 1 TIME.
1	- W.O.	75664	✓	REBLAND 1 TIME
1	- W.O.	79934	✓	
1	- W.O.	79933	✓	
1	- W.O.	79019	✓	REBLAND 1 TIME
1	- W.O.	79018	✓	
1	- W.O.	76254	✓	

Scope of Services: Agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as presentations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care: Acuren Group Inc. performs the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES
CLIENT REPRESENTATIVE: Andrew Sheldon PRINT: Andrew Sheldon SIGNATURE: [Signature] DTR # EG8914
TECHNICIAN (SIGNATURE): [Signature] REPORT REVIEWED BY: [Signature]
NAME (PRINT): Mike Johnson NAME: _____ INITIALS: _____
CGSB LEVEL: 1 SNT LEVEL: II CGSB LEVEL: _____ SNT LEVEL: _____
CGSB REG. NO: 60606 CGSB REG. NO: _____



LIQUID PENETRANT TEST REPORT

CLIENT	<u>DART Aerospace</u>	DATE	<u>March 15/12</u>	PAGE	
ATTENTION	<u>LINDA LACELLE</u>	ACUREN JOB No.	<u>188-12-0006</u>	TIME	AM <input type="checkbox"/>
ADDRESS	<u>1270 ABEL DEAN</u>	PO/VO No.			
	<u>HAWKESBURY, ON.</u>	WORK LOCATION	<u>HAWKESBURY</u>		
PROJECT	<u>F.P.I. on CROSS TUBES AND MACHINED PARTS</u>	ACCEPTANCE STD.	<u>ASTM 1417/1418-08</u>	REV./DATE	<u>2005</u>
ITEM(S) EXAMINED	<u>(2) CROSSTUBES, (4) MACHINED SLEEVES</u>				

JOB DESCRIPTION	PROCEDURE No. <u>LT-2002</u> REV./DATE <u>2008</u>	TECHNIQUE No. <u>LT-2002</u> REV./DATE <u>2008</u>
PART NO.	<u>SEE RESULTS</u>	MATERIAL <u>STAINLESS STEEL</u> THICKNESS <u>VARIABLE</u>
SCOPE	<u>ADJET FLUORESCENT LIQUID PENETRANT INSPECTION</u> <u>WAS CARRIED OUT ON 100% EXTERNAL SURFACE.</u>	

TEST DETAILS					
METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> WATER WASH	<input type="checkbox"/> SOLVENT REMOVABLE	<input type="checkbox"/> POST EMULSIFIED
FAMILY BRAND	<u>UNIONFLUX</u>		BLACK LIGHT S/N <u>16459</u>	<input type="checkbox"/> OUTPUT > 1000 μ W/cm ²	<input type="checkbox"/> AMBIENT < 2 fc
PENETRANT	<u>2407</u>	MINIMUM DWELL TIME <u>45</u> MIN.	LIGHTING EQUIP. <input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT	<input type="checkbox"/> OUTPUT > 100 fc @ SURFACE	
PENETRANT REMOVER	<u>H2O</u>	MINIMUM DRY TIME <u>>10</u> MIN.	OTHER		
DEVELOPER	<u>SAD 52</u>	MINIMUM DWELL TIME <u>10</u> MIN.	LIGHT METER S/N <u>1098866</u>	CAL DUE DATE <u>2-14-23</u>	
DEVELOPER TYPE	<input checked="" type="checkbox"/> NON AQUEOUS	<input type="checkbox"/> AQUEOUS	<input type="checkbox"/> DRY		

TEST SURFACE					
SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> SHOT BLASTED	<input type="checkbox"/> CLEAN BARE METAL
SURFACE TEMPERATURE	<input type="checkbox"/> < -4°C/ 20°F	<input type="checkbox"/> -4°C/ 20°F TO 10°C/ 50°F	<input checked="" type="checkbox"/> 10°C/ 50°F TO 52°C/ 125°F	<input type="checkbox"/> > 52°C/ 125°F	

RESULTS- <input type="checkbox"/> METRIC <input checked="" type="checkbox"/> IMPERIAL	
<u>W.O.I.</u>	
<u>1 73724 - CROSSTUBE</u>	<u>✓</u>
<u>1 78577 - CROSSTUBE</u>	<u>✓</u>
<u>1 78578 - CROSSTUBE</u>	<u>✓</u>
<u>1 79633 - CROSSTUBE</u>	<u>✓</u>
<u>1 79632 - CROSSTUBE</u>	<u>✓</u>
<u>1 76247 - CROSSTUBE</u>	<u>✓</u>
<u>1 76246 - CROSSTUBE</u>	<u>✓</u>
<u>1 78707 - SLEEVE'S</u>	<u>✓</u>

- HAD BEEN REBLOWN PREVIOUSLY

Scope of Services
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representation or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES	
CLIENT REPRESENTATIVE <u>Andrew Sheldon</u>	DTR # <u>E-38717</u>
TECHNICIAN (SIGNATURE): <u>[Signature]</u>	REPORT REVIEWED BY:
NAME (PRINT): <u>Mike Thorsen</u>	NAME INITIALS
TECHNICIAN	2 ND TECHNICIAN
CGSB LEVEL <u>II</u> SNT LEVEL <u>II</u>	CGSB LEVEL SNT LEVEL
CGSB REG. NO. <u>6606</u>	CGSB REG. NO.

14910

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